

# OPERATING MANUAL

MODEL 221 VIBROTEST

Te C  
2007

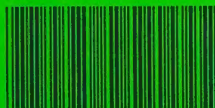


ASSOCIATED RESEARCH INCORPORATED

CHICAGO, ILLINOIS

U. S. A.

MP MASTER



MA30051



# ASSOCIATED RESEARCH INCORPORATED



Insulation resistance testing is a subject of ever increasing importance. It is a subject on which much has been written and yet a thorough knowledge of its many problems is the exception rather than the rule.

This booklet is to serve primarily as guide in the use of Vibrotest and not as a treatise on insulation resistance testing.

We have made no attempt to go into the extensive description necessary to thoroughly cover the subject.

If, after you have become familiar with Vibrotest, you desire additional information on insulation resistance we suggest that you communicate with us.



## ASSOCIATED RESEARCH INCORPORATED



**MODEL 221 VIBROTEST  
WITH COVER OPENED**

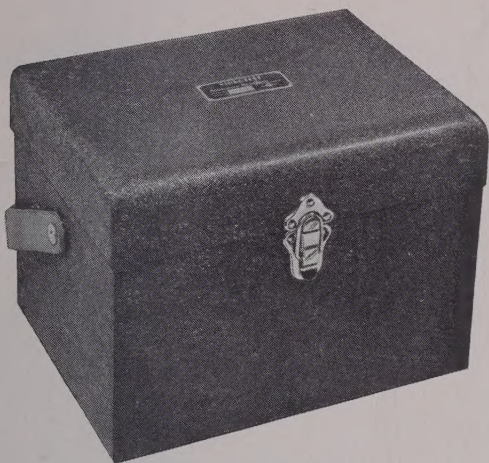
The Model 221 represents the very latest in engineering design and development particularly for use aboard ships where space, ruggedness, compactness, and weight are factors.

The Model 221 is a highly accurate, sensitive, and reliable testing instrument. You will find it an instrument of innumerable uses, and its usefulness increases as you become more familiar with it.

Ranges of this complete testing instrument are as follows: 0-200 Megohms at 500 volts, 0-2000 ohms (both on left hand meter); 30-150-300 volts D.C. and 3-30-300 amperes D.C. (on right hand meter).

Before attempting to use the Model 221 Vibrotest please take time to read the following instructions and familiarize yourself with the accompanying diagrams.





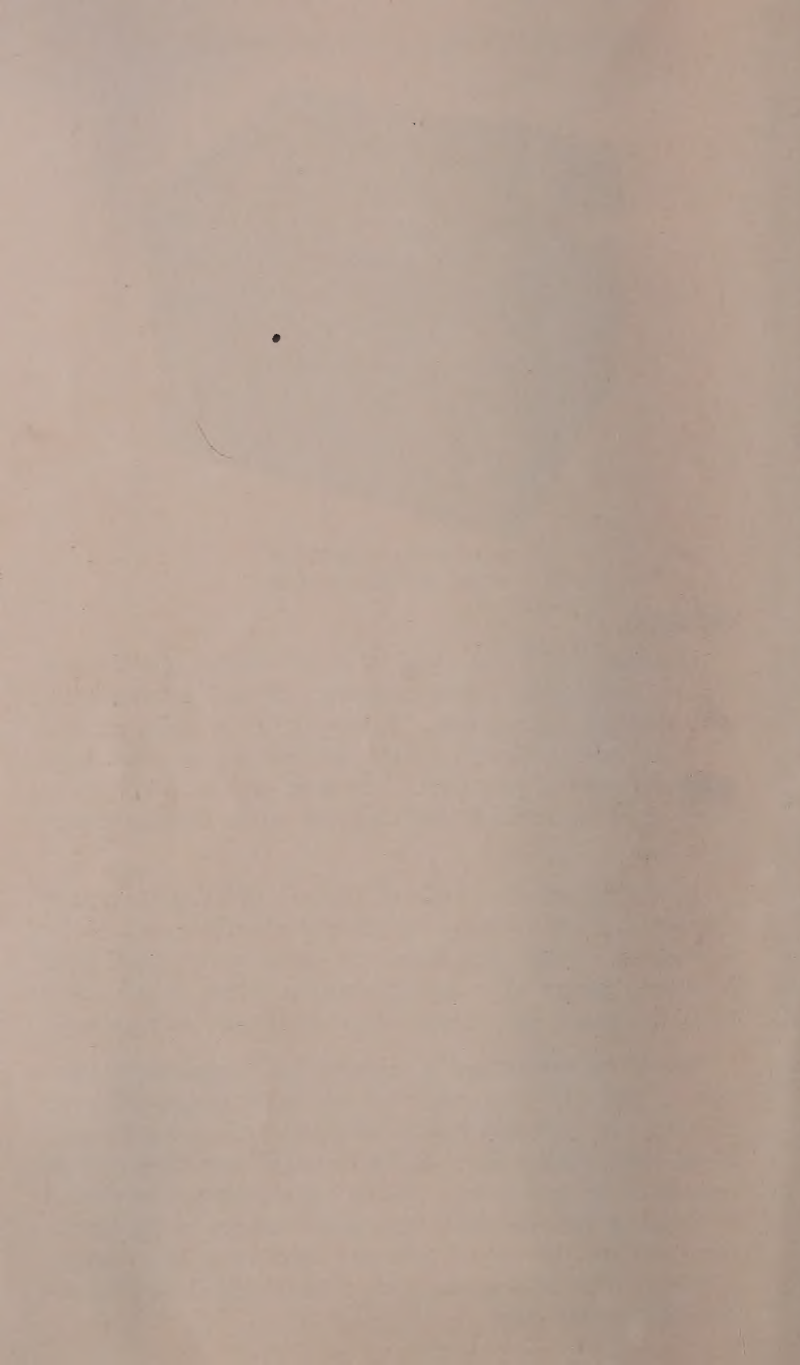
**MODEL 221 VIBROTEST  
WITH COVER CLOSED**

## **GENERAL**

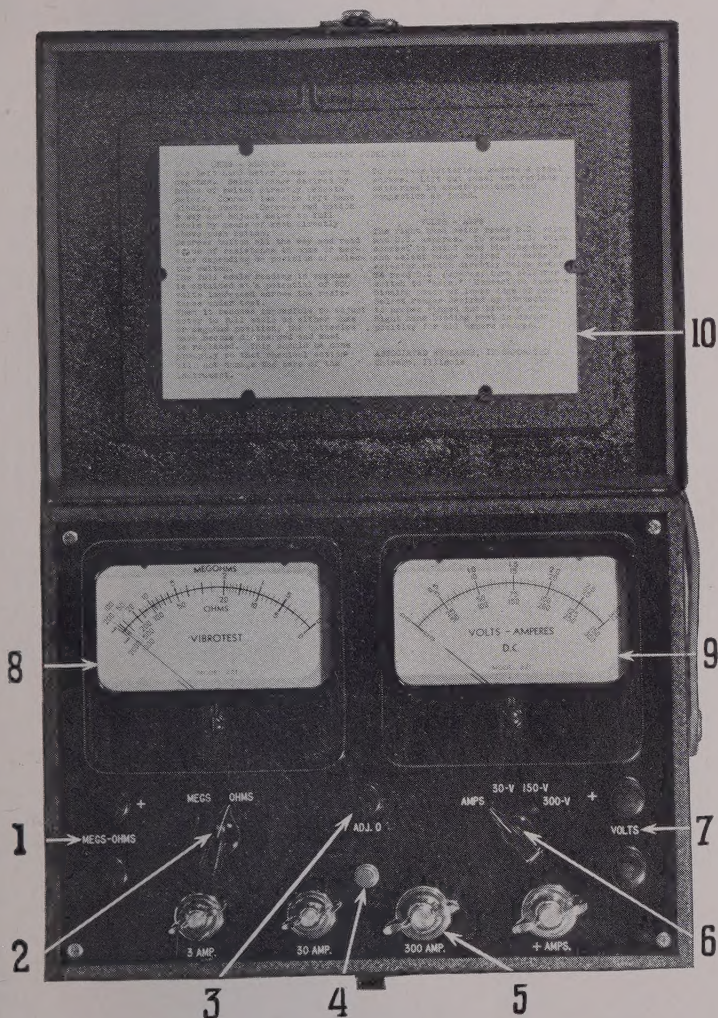
Housing the Model 221 is a substantial metal case crackle finished for added protection as well as durability and pleasing appearance. Attached to the main case is a strong leather handle which need not be removed from the instrument at any time. It is arranged to swing either away from or towards the operator when the instrument is in use.

In the hinged cover you will observe that there is a brief instruction card covering the general characteristics of the instrument. Under this instruction card is a hinged door providing access to a compartment in which a few small tools, test leads, record sheets and other data may be kept.

When the instrument is shipped this compartment contains a pair of 5 foot insulated test leads having alligator clips at test end and spade terminals at instrument end. These leads are for use with the megohm, ohm, and voltage ranges of the instrument. Under no circumstances should these leads be used with the current ranges of the instrument as they are not of sufficient capacity to carry heavy currents. This is of extreme importance and should be observed in every case.



# ASSOCIATED RESEARCH INCORPORATED



MODEL 221 VIBROTEST WITH HINGED COVER OPEN.  
NOTE THE NUMBERS AND ARROWS INDICATING THE  
VARIOUS PARTS OF THE UNIT.

TO FACILITATE ACQUAINTANCE WITH THE INSTRUMENT  
THESE NUMBERS WILL BE FOUND IN THE FOLLOWING TEXT  
WHenever A SPECIFIC PART IS MENTIONED.



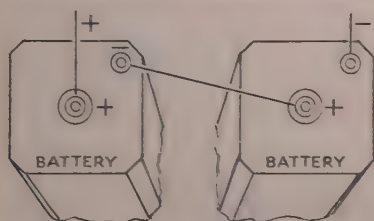
## ASSOCIATED RESEARCH INCORPORATED

### POWER SUPPLY—BATTERIES

The power for the ohms-megohm readings is obtained from two No. 6 dry cells which are mounted in the base of the instrument. As shipped from the factory the instrument is equipped with two long life No. 6 dry cells. Under ordinary service and if not abused these cells should last from 12 to 14 months depending upon the use to which the instrument is put and the frequency with which it is used. During this period these cells need not be checked or inspected. So long as it is possible to bring the pointer to the right hand zero of the instrument when the push button is depressed half way and the zero adjust knob rotated, then the batteries are usable. When it is no longer possible to bring the pointer to the right hand zero during this adjustment then the batteries require replacement.

To replace the batteries remove the four corner screws in the panel and gently lift the panel straight up and out of the case. Note that a pair of leads run from the under side of the panel to the batteries and take care in handling so as not to break these leads.

Remove the clamp that holds the batteries in place, disconnect the batteries from each other and from the leads running from the batteries to the panel. Take care to observe that the red lead is positive and the black lead is negative. Also observe that the batteries are connected in series. Be sure when replacing these batteries that the batteries with which they are replaced are connected in exactly the same way as shown in diagram below.



**BATTERY CONNECTION DIAGRAM**

*(Continued on next page)*



## ASSOCIATED RESEARCH INCORPORATED

Also be sure that the batteries are restored to the compartment provided for them in such a way that the metal portions of the batteries touch no metal of the case and that all connections to the batteries are tight. Return the panel to its original position and replace the screws in the four corners making sure that they are tight but do not tighten them to the extent that the bakelite panel is broken at the corners.

There is quite a little space inside the case but this must not be used for storing or carrying any material because this space is necessary in order to provide for the heat dissipation required when the ammeter portion of the tester is used.

### OHMMETER AND MEGOHMMETER

The left hand instrument (8), you will observe has two ranges marked on the scale, namely, 0-200 megohms and 0-2,000 ohms. These two ranges terminate in the two binding posts (1) at the left hand edge of the panel. Selection of the desired range, either 0-200 megohms or 0-2,000 ohms is made through the switch (2) directly under the meter which is marked Megs-Ohms.

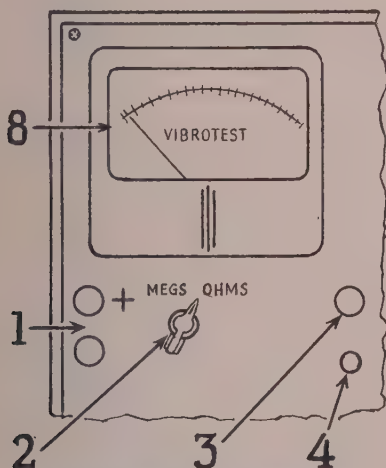
Directly to the right of this selector switch is a red push button (4) and above this is knob (3) marked "Adj-0". These three, the switch, the push button, and the knob together with the left hand binding posts and the meter may be considered for the moment as an entirely separate unit.

To operate this portion of the instrument as either an ohmmeter or a megohmmeter the procedure in every case is as follows. Select the range desired (megohms or ohms). Depress the red push button (4) half way and set the Adj-0 knob (3) until the pointer of the instrument is on zero at the extreme right hand end of the scale. This operation adjusts the instrument for its proper circuit conditions and takes into consideration any variations in the initial voltage supplied to the circuit under test. When this adjustment



## ASSOCIATED RESEARCH INCORPORATED

has been made, depress the button (3) its full travel and read the resistance, in ohms or megohms, of the circuit under test.



OHM-MEGOHM PORTION OF  
MODEL 221 VIBROTEST

In adjusting the instrument for the initial setting it is immaterial whether it is connected to the circuit or not. The Vibrotest is so constructed that the presetting of the instrument before connection to the circuits to be tested can be accomplished with no error. Likewise it is unnecessary to short the terminals or to connect the leads together in setting the instrument before making a test. This point is of extreme importance because it greatly facilitates testing and tends to eliminate any error on the part of the operator in making the initial setting.

### MEGOHM READINGS

Readings on the megohm range of the instrument are obtained at an impressed potential of 500 volts. This potential is obtained from the two #6 dry cells contained in the base of the instrument. Through the use of a synchronous vibrator and considerable accessory equipment

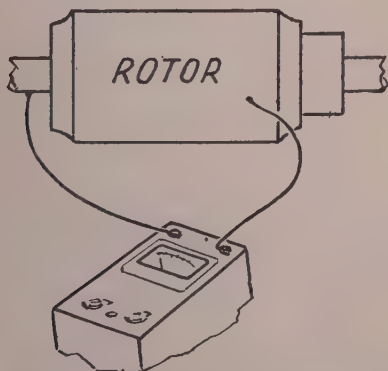
*(Continued on next page)*



## ASSOCIATED RESEARCH INCORPORATED

this initial voltage is stepped up to in excess of 500 volts A.C., rectified and filtered to provide 500 volts D.C. free of ripple and harmonics. Because of the fact that the voltage is provided from batteries and as a result of the extreme stability of the vibrator system this instrument is classified as a constant potential instrument when used to measure insulation resistance. When the initial settings have been made, as described on page 6 500 volts appears across the terminals of the instrument. A reading is then taken directly in megohms on the basis of the initial impressed voltage of 500 volts.

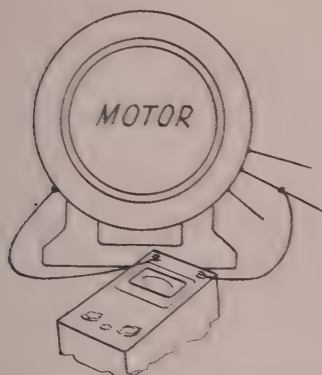
The megohm range is used almost entirely for checking insulation resistance between conductors of electrical circuits, between conductors and ground and between current carrying parts and non current carrying parts of all types of electrical equipment and machinery. Checking insulation resistance need not involve elaborate connections. Sketched below are a few of the more common connections.



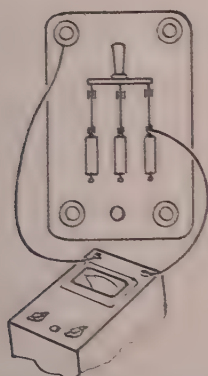
**ROTOR—CONNECTIONS FOR CHECKING INSULATION  
RESISTANCE BETWEEN ARMATURE AND SHAFT**

*(Continued on next page)*





MOTOR—CONNECTIONS FOR CHECKING INSULATION  
RESISTANCE BETWEEN LEADS AND FRAME



TYPICAL CONNECTION FOR CHECKING INSULATION  
RESISTANCE BETWEEN LIVE PARTS OF PANEL BOARD  
AND SWITCH

## MEGOHMS

It is generally assumed that if the insulation resistance value is higher than 1 megohm that the insulation resistance can be considered as satisfactory. Where specific values are required either by the manufacturer or by other rules and regulations these, of course, should in every case be followed.



## ASSOCIATED RESEARCH INCORPORATED

### **GUARD CIRCUIT**

In testing insulation resistance in locations where much moisture is present considerable difficulty can be experienced if the test equipment is not guarded to prevent surface leakage across the panel of the instrument itself. The positive terminal of the Vibrotest is provided with a guard ring and the internal circuit is completely guarded to prevent any surface leakage across the panel of the instrument, or across the measuring circuit, from entering the indicating instrument circuit. Therefore, correct insulation resistance readings are obtained at all times when using the Vibrotest Model 221 in accordance with instructions.

### **CAPACITIVE CIRCUITS**

Many large machines and many cables particularly parallel cables, have an electrostatic capacity. This capacity varies with the size of the equipment being tested particularly in rotating machinery such as generators and motors, and in the length of the cables being tested in the case of electrical power cables, telephone cables, etc.

When electrostatic capacity is present, in equipment under test, time should be allowed for the capacity to become charged from the Vibrotest.

The presence of electrostatic capacity in a test circuit can be readily determined when using the Vibrotest to check insulation resistance. If present in the circuit under test, capacity will cause the pointer of the Vibrotest to drift. Depressing push button as far down as it will go, will result in sudden swing of pointer across scale to a megohm reading and then a gradual drift until a point of stability is reached at the true megohm reading. If it is desirable to know the capacity present in microfarads, this can be accomplished by determining the length of time required for the pointer to reach final rest after the initial swing. Charging time with the Vibrotest runs 15 seconds per microfarad.

*(Continued on next page)*



## ASSOCIATED RESEARCH INCORPORATED

A two microfarad capacity would require 30 seconds to become charged. If when checking insulation resistance the pointer immediately assumes a position of rest at the megohm reading it can be assumed that the circuit has no capacity.

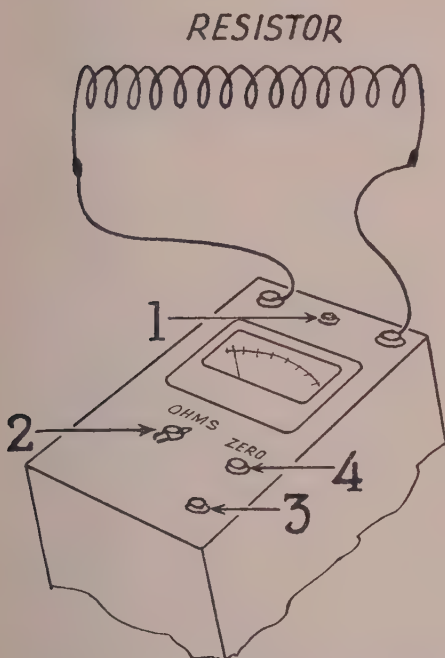
Disconnecting of test leads from capacity circuits normally subjects the operator to severe shocks due to capacity discharge. In the Vibrotest this danger is completely eliminated by ingenious design. Releasing the push button short circuits the leads thru a high value resistor, thereby providing a path for the discharge of the electrostatic charge previously built up in the circuit.

### OHMMETER

The ohmmeter range of the instrument is exceedingly handy to check continuity of all types of circuits. This ohmmeter provides an easy means of determining the resistance of all types of low resistance windings such as motor, armature circuits, stators, rotors, control box coils, automatic starter coils, hold-in coils, in fact any type of electrical circuit where the overall resistance is less than 2,000 ohms can be readily checked with this portion of the instrument.

With the range selecting switch in the "ohms" position connections for the reading of low ohm values are the same as for the megohm position of the switch. To read ohms or megohms the resistance under test must always be in series with the two test leads.





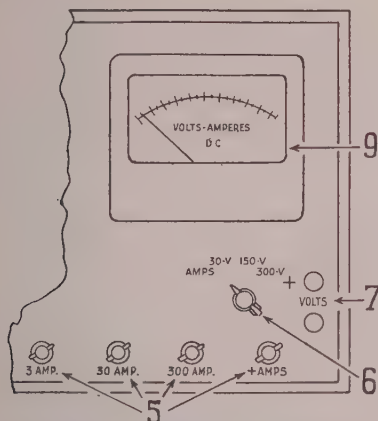
SKETCH OF USUAL METHOD OF CONNECTION  
FOR CHECKING LOW RESISTANCE VALUES

### D.C. VOLTMETER AMMETER

The right hand instrument (9) of the Model 221 Vibrotest provides readings of 30-150-300 volts direct current and 3-30-300 amperes direct current when connected correctly and with the selector switch in the proper position.

Directly under the instrument is a selector switch (6) designated "amps," and "300v.-150v.-30v." This is used to select either the correct voltage range or to connect the instrument to its shunt circuit for reading amperes.





**VOLTS—AMPERES PORTION OF  
MODEL 221 VIBROTEST**

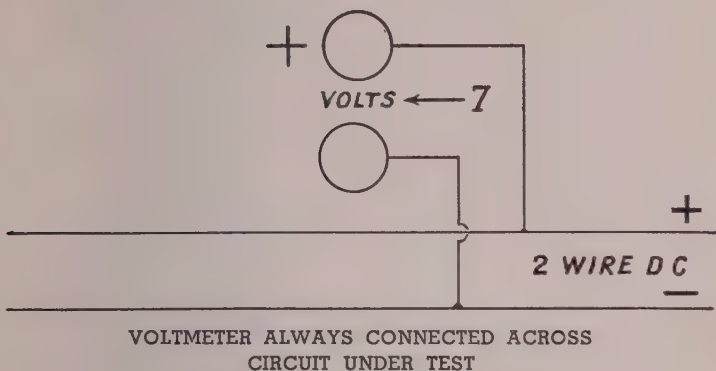
## TESTING FOR VOLTAGE READINGS

Voltage ranges are obtained at the bakelite-top binding posts (7) located at the right hand side of the panel. With the selector switch (6) on the proper voltage range the voltage appearing across the test circuit can be read directly upon the scale of the instrument (9) in volts D.C. with an accuracy of  $\pm 1\%$  of full scale value. Always connect Voltmeter across circuit under test. See Sketch, Page 14.

It is desirable whenever connecting to an unknown voltage source to always place the switch (6) in the highest range position first. As the desired voltage is determined, select a lower range on the Voltmeter by means of the switch, (6). The greatest accuracy is obtained when the reading appears in the upper three quarters of the scale.



## ASSOCIATED RESEARCH INCORPORATED



In reading voltages the test leads provided for the meg-ohm range may be used. Any suitable lead wire can be used for that matter as the resistance of the wire is of no importance provided it is sufficiently large enough to permit 10 milliamperes of current to flow.

While the instrument is extremely rugged, care should be taken to prevent slamming the pointer across scale due to connecting the instrument to a higher voltage than the range which has been selected.

When properly connected the voltmeter portion of this instrument will read within  $\pm 1\%$  of full scale value of any and all ranges.

### CURRENT READINGS

At the lower edge of the instrument panel will be found four binding posts (5) marked 3 amp., 30 amp., 300 amp., and + amps. These are for the current ranges of the instrument and are so arranged that the "+amps." binding post is used for all these ranges. The ranges are changed by selecting the proper binding post for the range in amperes full scale as required.

Here again it is desirable to always select the high range if in doubt as to the amount of current present in the cir-

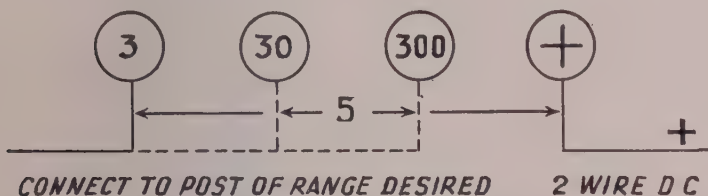
*(Continued on next page)*



**CURRENT READINGS—Continued**

cuit. Then move down thru the other ranges to the range at which the greatest accuracy is obtained.

The ammeter, of course, should always be connected in series with the circuit under test, as below.



**SERIES CONNECTION OF AMMETER**

The Figure 5 above refers to Number 5 of illustrations on pages 4 and 13.

Even though the ammeter is connected in series no reading will be apparent until the selector switch (6) directly below the meter is turned to the "amps" position. This connects the instrument across the shunt as a millivoltmeter so that the current in the circuit under test can be read.

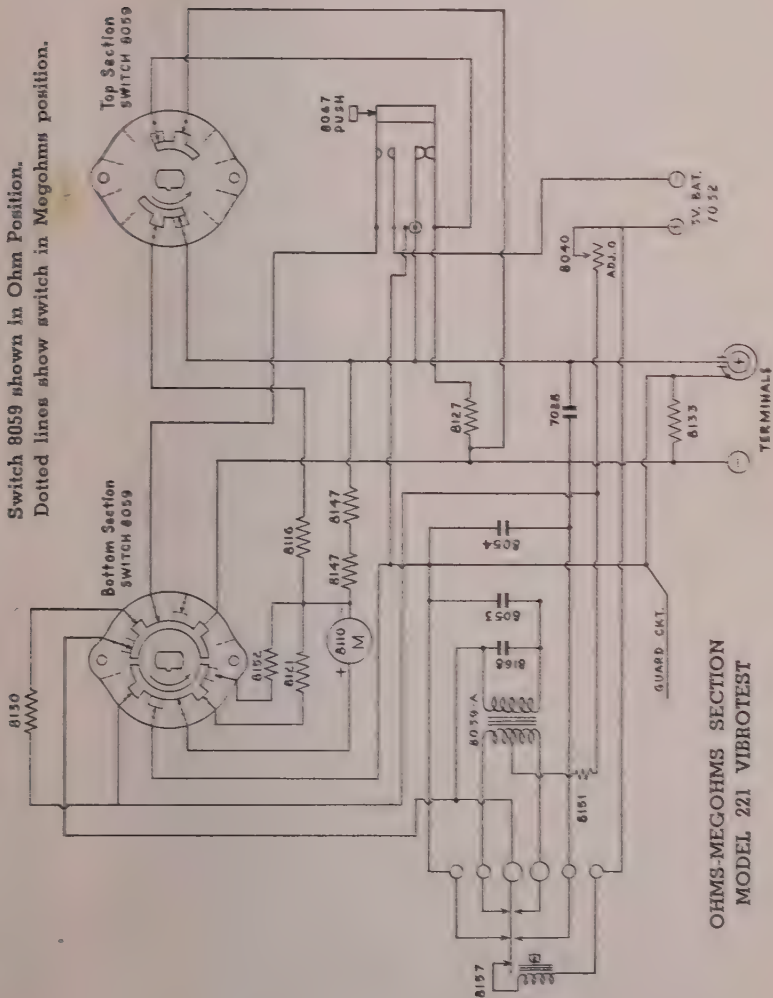
When using the ammeter portion of the instrument wire of sufficient current carrying capacity should be used so as to permit the current to flow without reducing or changing the circuit conditions through the introduction of too much resistance in the circuit.

When properly connected the ammeter portion of this instrument will read within  $\pm 1\%$  of full scale value of any and all ranges.



## ASSOCIATED RESEARCH INCORPORATED

Switch 8059 shown in Ohm Position.  
Dotted lines show switch in Megohms position.

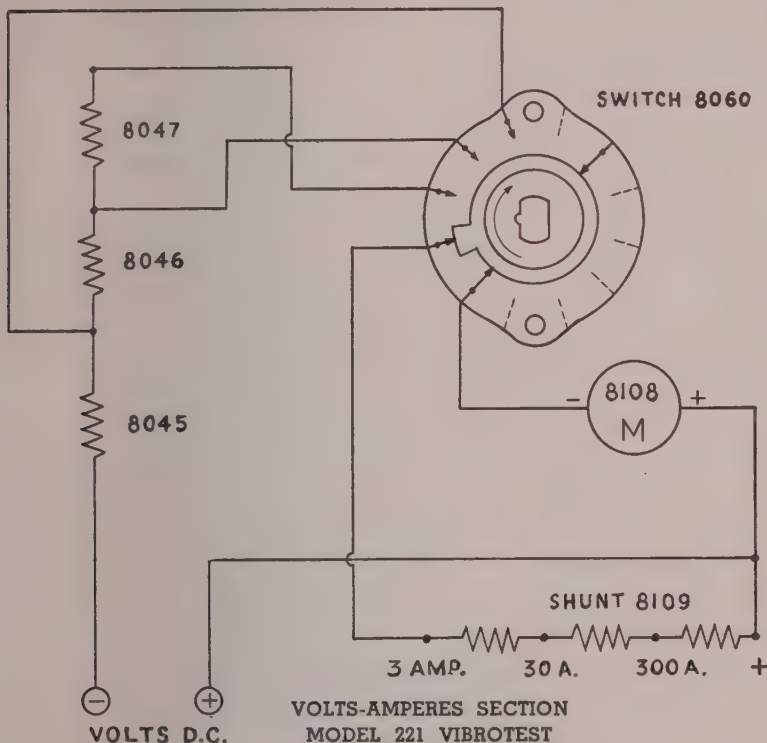


OHMS-MEGOHMS SECTION  
MODEL 221 VIBROTEST

See Page 17 for Description of Parts Shown in this Diagram.



# ASSOCIATED RESEARCH INCORPORATED



## PARTS LIST FOR VIBROTEST DIAGRAM

- |                                                       |                                                             |
|-------------------------------------------------------|-------------------------------------------------------------|
| 7028—0.01 Mfd. 1600 volt paper condenser.             | 8108—Volt-Ampere instrument.                                |
| 7032—1½ volt standard dry cell. 2 required.           | 8109—3-30-300 ampere shunt.                                 |
| 8039—Special power transformer.                       | 8110—Ohms-Megohms instrument.                               |
| 8040—Zero adjust control wire wound resistor, 3 ohms. | *8116—Wire wound resistor.                                  |
| 8045—Wire wound resistor.                             | 8121—Wire wound resistor.                                   |
| 8046—Wire wound resistor.                             | 8127—Wire wound resistor.                                   |
| 8047—Wire wound resistor.                             | *8130—Wire wound resistor.                                  |
| 8053—0.45 Mfd. 400 volt oil impregnated condenser.    | *8133—Carbon resistor 0.5 to 2.0 megohm, ½ watt to 1 watt.  |
| 8054—0.7 Mfd. 400 volt oil impregnated condenser.     | 8147—Wire wound resistor, 2 required.                       |
| 8059—6 pole 2 position selector switch.               | *8151—Wire wound resistor.                                  |
| 8060—Single pole 4 position selector switch.          | *8152—Carbon resistor, ½ watt. 10,000 to 30,000 ohms.       |
| 8067—Push button and switch assembly.                 | 8157—Special 3 volt vibrator.                               |
|                                                       | 8168—0.001 Mfd. 2000 volt oil impregnated buffer condenser. |

\*These parts require special adjustment at time of calibration. It is impractical to furnish these replacement parts without the test set being sent in.



## ASSOCIATED RESEARCH INCORPORATED

### GUARANTEE

All instruments of our manufacture are guaranteed to be free from mechanical and electrical defects due to faulty material or workmanship, and any instrument proving defective under this guarantee, within one year from date of shipment, will be repaired or replaced free of charge when returned to our factory prepaid, provided the instrument has not been tampered with or subjected to gross misuse. We cannot assume responsibility for repairs made outside our plant. This guarantee does not cover batteries furnished with or used with our equipment.



Made and Guaranteed by  
ASSOCIATED RESEARCH INCORPORATED

Manufacturers of

Vibrotest—Insulation Testing Instruments

Vibroground—For the Measurement of Ground Resistances

Hypot—Insulation Breakdown Testing Instruments

Keeler Polygraph—For Detection of Deception

Chicago, Illinois

U. S. A.

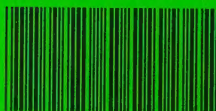
Offices and Field Engineers in Most Large Cities







MP MASTER



MA30051

PRINTED IN U. S. A.